A Watershed Conditions Report For the State of Kansas HUC 11030001 (Middle Arkansas-Lake McKinney) Watershed

Kansas Department of Health & Environment
Bureau of Water
Watershed Management Section
1000 SW Jackson
Topeka, KS 66612

Watershed Conditions Report
For
HUC 8 11030001 (Middle Arkansas-Lake McKinney)

Prepared by
Kansas Department of Health and Environment (KDHE)
Nonpoint Source Section
2/25/01

EXECUTIVE SUMMARY

This Watershed Conditions Report is designed to serve as a water quality "atlas", and is intended to provide stakeholders in water quality with a tool to assess the condition of water resources within their watershed. Surface water quality for HUC 8 11030001 streams and rivers is generally in fair to good condition with majority of the surface water bodies supporting their designated uses. The primary pollutant concerns are fecal coliform bacteria (FCB), pH, sulfate, ammonia, and boron. FCB is present in human and animal waste and serves as an indicator of potential disease causing organisms. pH determines the alkalinity or acidity of water in the lake. If the water is too basic or acidic it can potentially stress or kill the aquatic life and vegetation. Ammonia is a chemical which is toxic to fish and aquatic organisms. Sulfate is a naturally occurring mineral that can cause taste and odor problems in drinking water. Sulfates are dissolved into groundwater as the water moves through various sulfur containing rock formations. Boron is a naturally occurring element which at high concentrations can be toxic.

There are a few small county and city lakes within the Huc 8 11030001 watershed. The primary pollutant concerns for lakes/wetland areas within the watershed are eutrophication, low dissolved oxygen, excess biomass and insufficient flow. Low DO levels typically coincide with an abundance of algae, which may be caused by excess nutrients. An abundance of algae causes the population of decomposers to increase, which in turn uses up the oxygen in the stream or river. Potential sources of excess nutrients include feedlots, wastewater treatment facilities, septic systems, wildlife, and grazingland. Eutrophication is a natural process which creates conditions favorable for algae blooms and excess plant growth. This process is often accelerated by excess nutrient loading from the watershed. Excess biomass is an abundance of vascular plants that tends to be a nuisance and interferes with designated water uses. An insufficient flow of water in this area is fairly common due to the low levels of annual precipitation. Insufficient flow into a lake is a concern because it can cause lake temperatures to rise, low levels of dissolved oxygen, and stagnation.

Groundwater resources in HUC 8 11030001 include the High Plains and Dakota aquifers and alluvial aquifers of the Arkansas River. Water from these aquifers is considered generally in good condition, but typically hard to very hard. Additionally, sodium and chloride content can increase with depth.

PURPOSE

The Watershed Conditions Report is designed to serve as a water quality "atlas" for a given watershed, and is intended to provide Watershed Stakeholders Committees (WSC) with a tool to assess the condition of water resources within their watershed.

BACKGROUND

The Clean Water Act mandates that States assess the quality of their waters and implement Total Maximum Daily Loads (TMDLs) for water bodies that do not meet their designated uses. The following is a summary of steps taken by the State of Kansas to comply with these requirements of the Clean Water Act.

The Kansas Department of Health and Environment (KDHE) prepared the Kansas Unified Watershed Assessment in 1998. This assessment classifies the State's watersheds into four categories. A Category I classification means the watershed is in need of restoration due to having water quality impairments or degradation of other natural resources related to an aquatic habitat, ecosystem health and other factors related to aquatic life resources. Category II watersheds are in need of protection. Category III are watersheds with pristine or sensitive aquatic system conditions on lands administered by federal, state, or tribal governments. Category IV watersheds are those for which there is insufficient data to make accurate classification. KDHE has assigned a restoration priority score to each Category I watershed.

As mandated by section 303(d) of the Clean Water Act, lakes and streams within the Category I watersheds, which do not meet water quality standards, are published biannually in the 303(d) list. Subsequently, lakes and streams which appear on the 303 (d) list are scheduled to have a Total Maximum Daily Load (TMDL) prepared. KDHE is currently preparing TMDLs for impaired stream segments located within the highest restoration priority watersheds.

To restore water quality within the Category I watersheds, KDHE recommends the implementation of a Watershed Restoration and Protection Strategy (WRAPS). The ultimate goal of the WRAPS process is to create and implement a plan to restore the health of water bodies that do not meet their water quality standards. Additionally, the WRAPS process will insure that water bodies that currently meet their water quality standards are protected.

KDHE recommends that the WRAPS process be implemented on a local level by a Watershed Stakeholders Committee (WSC). The WSC would have the responsibility of working with local and state agencies to develop a WRAPS plan. This plan should identify the following: public outreach methods; required monitoring activities based on water quality goals and outcomes; specific water quality problems; watershed coordinator/evaluator; actions to be taken to achieve water quality goals and outcomes; schedule for implementation of needed restoration measures; and funding needs.

Streams and Rivers

HUC 8 11030001

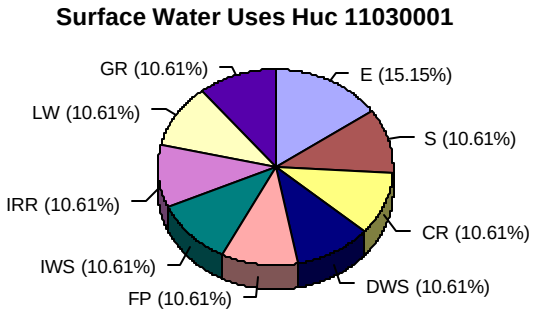
The Huc 8 11030001 watershed is ranked thirty-first in priority for watershed restoration throughout the state. According to the Unified Watershed Assessment, approximately 7% of the total miles of water in this watershed do not meet their designated uses. The Arkansas River, Sand Creek, Amazon Ditch, and Great Eastern Ditch are a few of the larger streams and rivers in this watershed. See Attachment 1 for a map of streams and rivers in HUC 8 11030001.

Designated Uses

This watershed is mostly a drainage basin for the Arkansas River, however, smaller streams and creeks are also within this area. There are approximately 174 public water supplies within the watershed, some of which draw water from the Arkansas River and it's alluvium. According to the Kansas Surface Water Register, the most common designated uses for streams and rivers in this watershed include: expected and special aquatic life uses, contact recreation, domestic water supply, and food procurement.

Figure 1

- E=Expected Aquatic Life Use Water
- FP=Food Procurement
- DWS=Designated domestic water supply use.
- GR=Designated for ground water recharge.
- LW=Designated for livestock watering use.
- IWS=Designated industrial water supply use.
- IRR=Designated for irrigation use.
- CR=Designated for contact recreational use.
- S=Designated for Special Aquatic Life



TMDL/Contaminate Concerns

Streams and rivers throughout Kansas have been sub-divided into segments. By dividing the streams and rivers into segments they can be better analyzed and understood. A reach of river or stream may have segments which vary greatly in water quality, based on surrounding land uses. The information below describes conditions based on stream and river segments.

Surface waters not meeting their designated uses will require Total Maximum Daily Loads (TMDLs). Currently, in this watershed, there is one segment requiring TMDLs. This segment is part of the Arkansas River and has the only monitoring site in the watershed due to the lack of stream miles within Huc 8 11030001.

The primary pollutant concerns for this segment are fecal coliform bacteria (FCB), pH, sulfate, ammonia**,** and boron. FCB is present in human and animal waste and serves as an indicator of potential disease causing organisms. pH determines the alkalinity or acidity of water in the lake. If the water is too basic or acidic it can potentially stress or kill the aquatic life and vegetation. Ammonia is a chemical which is toxic to fish and aquatic organisms. Sulfate is a naturally occurring mineral that can cause taste and odor

problems in drinking water. Sulfates are dissolved into groundwater as the water moves through various sulfur containing rock formations. Boron is a naturally occurring element which at high concentrations can be toxic. Monitoring site data for the segment of the Arkansas River in this watershed is included in Attachment 2.

Potential Pollution Sources

Potential Sources of ammonia are livestock, septic tanks, fertilizer, and municipal and industrial waste. Boron and Sulfate are naturally occurring and are often dissolved into the groundwater table from parent material underlying the watershed. Common sources of FCB include feedlots, septic systems, wildlife, and wastewater treatment facilities. In this watershed, the levels of FCB in the Arkansas River may be influenced by the current Garden City wastewater treatment facility. The city is constructing a new municipal facility which is approximately 50% complete. Until the new facility is running, the untreated wastewater from the old facility may continue to contribute to the high levels of FCB.

Below is a list of land uses within this watershed. Grassland is considered grazingland.

- Urban Area....1%
- Row Crop....34%
- Grassland....65%
- Wooded area.... .04%
- Water area....0%
- Other... .02

Feedlots: In Kansas, confined animal feeding operations (CAFOs) with greater than 300 animal units must register with KDHE. There are approximately 80 registered CAFOs located within HUC8 11030001 (this number, which is based on best available information, may be dated and subject to change). Waste disposal practices and waste water effluent quality are closely monitored by KDHE for these registered CAFOs to determine the need for runoff control practices or structure. Because of this monitoring, registered CAFOs are not considered a significant threat to water resources within the watershed. A portion of the State's livestock population exists on small unregistered farms. These small unregistered livestock operations may contribute a significant source of fecal coliform bacteria and nutrients, depending on the presence and condition of waste management systems and proximity to water resources.

Wastewater Treatment Facilities: There are approximately 8 municipal and industrial wastewater treatment facilities within the watershed (this number may be dated and subject to change). These facilities are currently regulated by KDHE under National Pollutant Discharge Elimination System (NPDES) permits. These permits specify the maximum amount of pollutants allowed to be discharged to the "waters of the State".

Septic Systems: There are currently thousands of septic systems within the watershed and this number is increasing. When properly designed, installed, and maintained, septic systems can act as an effective means of wastewater treatment. However, poorly maintained or "failing" septic systems can leach pollutants into nearby surface waters and groundwater. The exact number of failing septic systems within the watershed is unknown; however the number may be increasing due to the current trends in suburban development. Local Environmental Protection Programs and County health departments may provide excellent sources of information regarding the proper design, installation, and maintenance for septic systems.

Wildlife: Wildlife located throughout the watershed are not usually considered a significant source of nonpoint source pollutants. However, during seasonal migrations, concentrations of waterfowl can add significant amounts of fecal coliform bacteria and nutrients into surface water resources.

Row Crop Agriculture: As stated above, approximately 34% of the watershed's land is used for row crop agriculture. Row crop agriculture can be a significant source of nonpoint source pollution. Common pollutants from row crop agriculture include sediment, nutrients, pesticides, and fecal coliform bacteria. Row crop agriculture can be a source of FCB if manure is applied to the land as fertilizer. FCB can drain into surface water if manure is applied shortly before a rain shower or on frozen ground. Many producers within the watershed regularly implement and maintain BMPs to limit the amount of nonpoint source pollutants leaving their farm. Some common BMPs include: the use of contour plowing; use of cover crops; maintaining buffer strips along field edges; and proper timing of fertilizer application.

Urban/Suburban Runoff: Many urban landscapes are covered by paved surfaces including roads, driveways, parking lots, and sidewalks. These surfaces are impermeable and tend to divert water into storm drains at high velocities. This increased flow velocity from urban areas can cause severe stream bank erosion in receiving water bodies. Additionally, urban and suburban runoff may carry other pollutants like petroleum hydrocarbons and heavy metals. Currently, the watershed is only about 1% urban. Limiting paved surfaces is the key to slowing urban nonpoint source pollution. The use of grass swales, open spaces, and storm water retention ponds are recommended to slow runoff in urban areas.

The watershed has an increasing population living in suburban areas. Residential landscapes are often designed with large turf areas which require high amounts of water and chemicals to maintain. The use of excessive amounts of fertilizers and lawn care chemicals in residential areas can contribute a significant amount of pollution to nearby water resources. Suburban nonpoint source pollution can be limited by: using less lawn fertilizers and chemicals; control of construction sites; proper disposal of pet waste; establishing large areas of native vegetation; and conserving the amount of water use for plant maintenance.

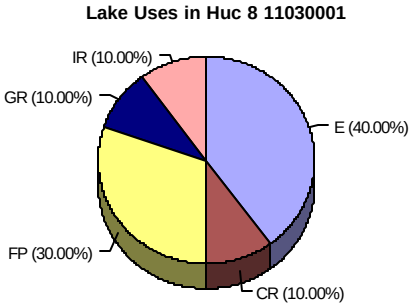
Lakes & Wetlands

Huc 8 11030001 is the home to two city and county lakes, one state fishing lake, and one wetland area. These include Lake McKinney, Beymer Lake, the Hamilton County State Fishing Lake(SFL), and the Hamilton Wetland Area. These lakes offer fishing, camping, trails for hiking, boating, and swimming. See Attachment 2 for a map of lakes and wetlands in HUC 8 11030001.

Designated Uses

According to the Surface Water Register, the majority of the lakes/wetland areas in this watershed are designated for expected aquatic life use, food procurement, and contact recreational use (Figure 2)

Figure 2



- E=Expected Aquatic Life Use Water
- FP=Food Procurement
- IR=Designated for irrigation use.
- CR=Designated for contact recreational use.
- GR=Designated for ground water recharge.

TMDL/Contaminate Concerns

Surface waters not meeting their designated uses will require Total Maximum Daily Loads (TMDL)s. Currently, 50% of the lakes/wetlands sampled in this watershed require TMDLs.

Currently, the Hamilton Wetland Area and the Hamilton County SFL are the two lakes/wetland areas requiring TMDLs. The primary pollutant concerns for the Hamilton Wetland Area are eutrophication and dissolved oxygen. Eutrophication is a natural process which creates conditions favorable for algae blooms and excess plant growth. This process is often accelerated by excess nutrient loading from the watershed. The excess plant and algae growth, influenced by the eutrophication process, encourages the population of decomposers to increase. Decomposers use oxygen within the water table limiting the amount of dissolved oxygen available for other aquatic organisms.

The Hamilton County SFL's primary pollutant concerns are eutrophication, excess biomass, and insufficient water flow. Excess biomass, often a result of eutrophication, is an abundance of vascular plants and algae that tends to be a nuisance and interferes with designated water uses. An insufficient flow of water in this area is fairly common due to the low levels of annual precipitation. Insufficient flow into a lake is a concern because it can cause lake temperatures to rise, low levels of dissolved oxygen, and stagnation.

Potential Pollution Sources

Excess nutrients such as phosphorous or nitrogen can cause an abundance of plants and algae, which use up oxygen in the water, suffocating fish and aquatic organisms. Potential sources of excess nutrients include feedlots, wastewater treatment facilities, septic systems, wildlife, row crop agriculture and grazingland. Based on the watershed's land use percentages, the primary pollutant sources for nutrients appear to be feedlots and row crop agriculture. Additionally, the municipal waste water treatment plants, registered feedlots and septic systems may contribute significant amounts of nutrients into the watershed.

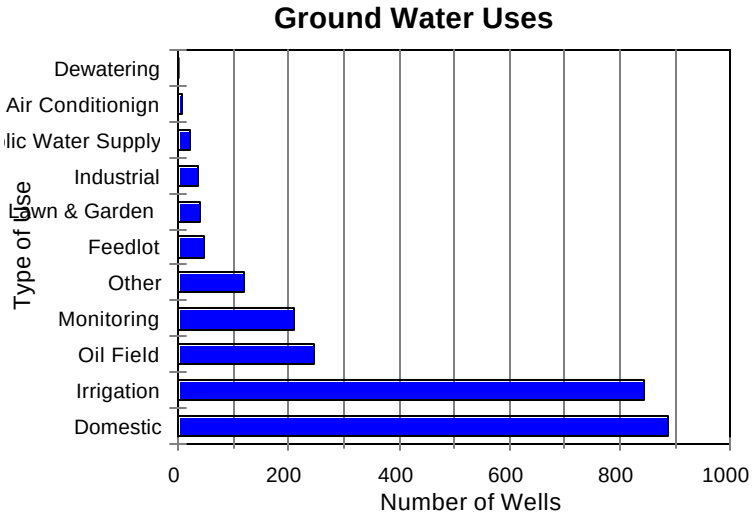
Groundwater

Major groundwater aquifers underlying this watershed include the High Plains and Dakota Aquifers along with alluvial aquifers of the Arkansas River and it's tributaries.

Designated Uses

There are approximately 2,466 groundwater wells located within the watershed (see figure 3 below). Water from these wells is used for oil field supply, domestic use, irrigation, monitoring, lawn and garden, industrial supply, public water supply, air conditioning, and feedlots.

Figure 3



Aquifer Characteristics

High Plains Aquifer: The High Plains aquifer underlies this watershed. Water from this aquifer is often used for irrigation. This water is typically hard to very hard but in good condition with no dominating pollutants.

Dakota Aquifer: The Dakota aquifer underlies this watershed. Water from this aquifer is used for irrigation, public use, and rural-domestic water supply. Water from this aquifer is good; however chloride and sodium content increase with depth.

Alluvial Aquifer: Alluvial aquifers of the Arkansas River and it's tributaries exist throughout the watershed. Alluvial aquifers provide the primary water source for many public water supplies located within the watershed. Water quality in alluvial aquifers is generally good; however nitrates, minerals, pesticides, and bacteria can be pollutant concerns.

Potential Pollution Types and Sources

Common groundwater pollutants include: nitrates, chloride, sulfates, bacteria and atrazine. Nitrate impaired groundwater is perhaps the most prevalent groundwater contamination problem in the State.

Nitrate: Nitrate is a naturally occurring compound and is an essential component of all living matter. However, high concentrations of nitrate in drinking water can cause adverse health effects including "blue baby" syndrome. Sources of nitrate include municipal waste water treatment plant discharges, runoff from livestock operations, leaching of fertilizer from urban and agricultural areas, and failing septic systems.

Chloride: Chloride is a naturally occurring mineral found in Kansas lakes, streams, and groundwater. In high concentrations, chloride can cause deterioration of domestic plumbing, water heaters, and municipal water works. The primary source of chloride impacted groundwater is intrusion of salt water from deeper formations, often due to improperly constructed water wells which allow confined aquifers to come into contact with each other.

Sulfates: Sulfate is a naturally occurring mineral that can cause taste and odor problems in drinking water. Sulfates are dissolved into groundwater as the water moves through various sulfur containing rock formations.

Bacteria: Fecal coliform bacteria are found in the digestive systems of warm blooded animals. In the environment coliform bacteria is an indicator of potential disease causing organisms. Potential sources of bacteria contamination in groundwater include livestock facilities, septic systems, pets, and wildlife. Many wells are impacted by bacteria due to improper construction which allows water from the surface to funnel directly into the well.

Ammonia: Ammonia is a chemical which is toxic to fish and aquatic organisms. Sources of ammonia are livestock, septic tanks, fertilizer, municipal and industrial waste.

TSS: TSS stands for Total Suspended Solids which are particles such as soil, algae, and finely divided plant material suspended in water. Sources of TSS are soil erosion from cropland, stream banks, or construction sites, and municipal and industrial waste.

VOCs: Volatile Organic Compounds, also called purgeable organics, are components of fuels and solvents. They are ingredients in many household and industrial products. Sources of VOCs are leaking fuel storage tanks, trash dumps, and some agricultural pesticides.

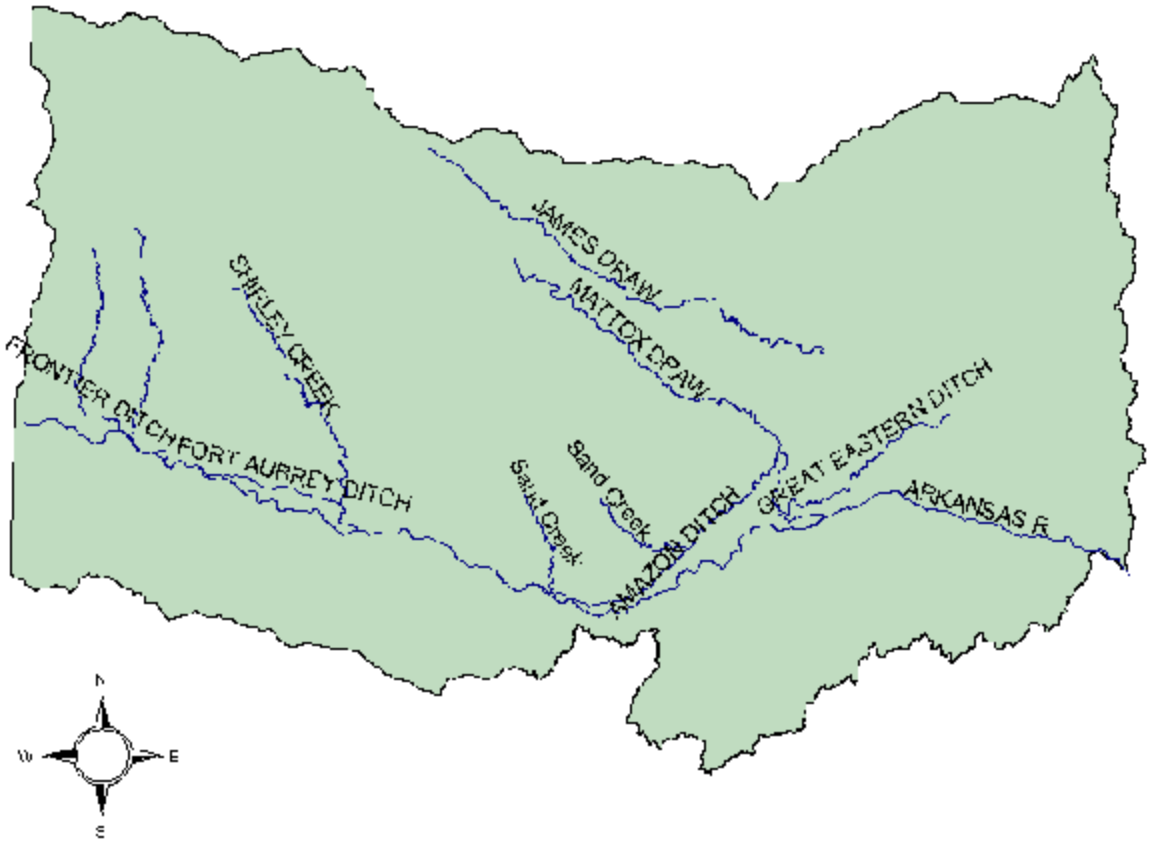
Iron: Iron is a naturally occurring element found in the soil throughout Kansas. It is an annoyance as it has an objectionable taste, causes a red stain to porcelain fixtures and laundry, and causes plumbing irritations.

Manganese: Manganese is a naturally occurring element and causes an unpleasant taste in drinking water, stains porcelain and laundry, and collects deposits in plumbing. It is naturally occurring throughout the soils in the state.

Attachment 1

Maps

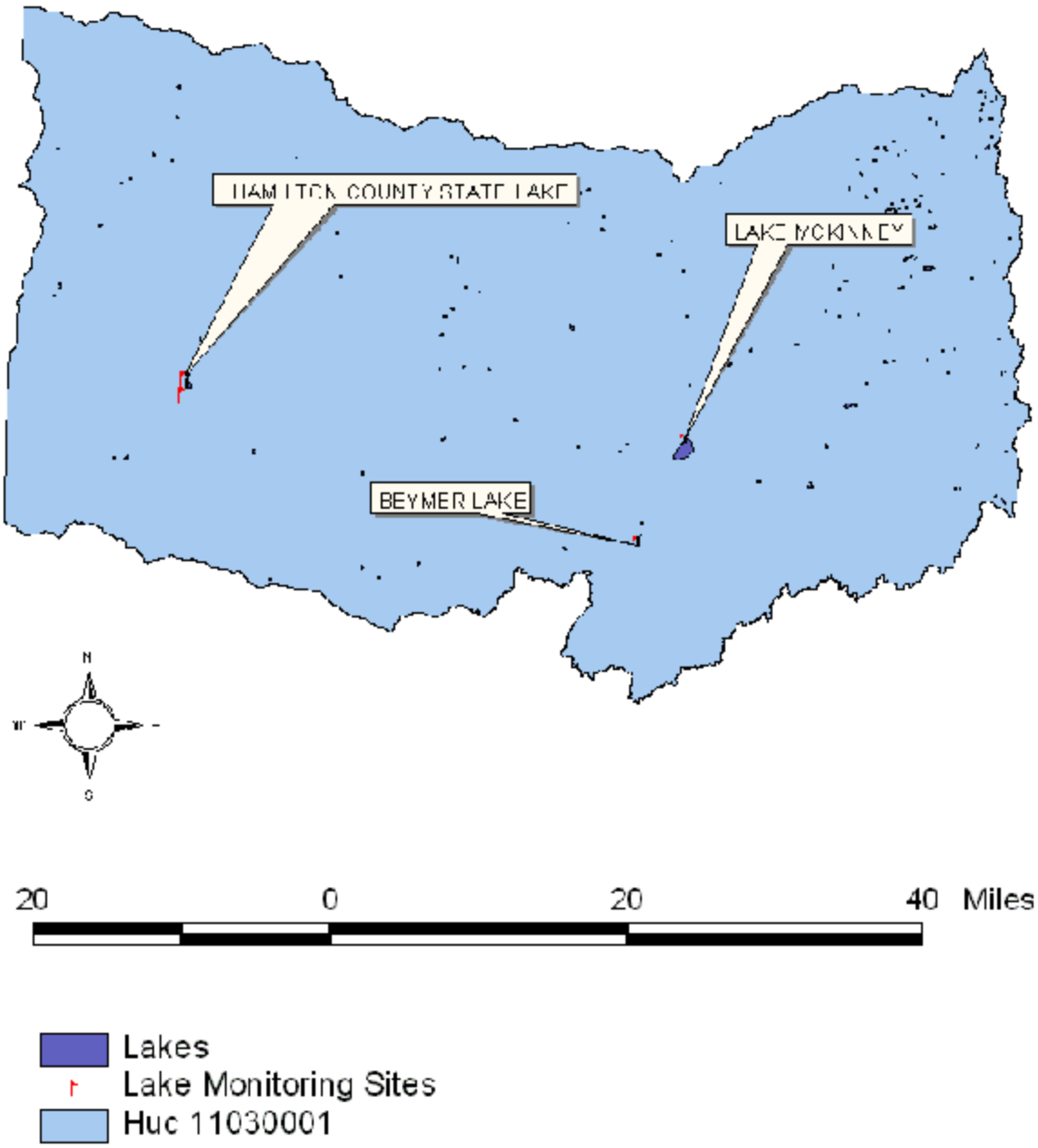
Huc -11030001- Middle Arkansas-Lake McKinney
Streams & Rivers



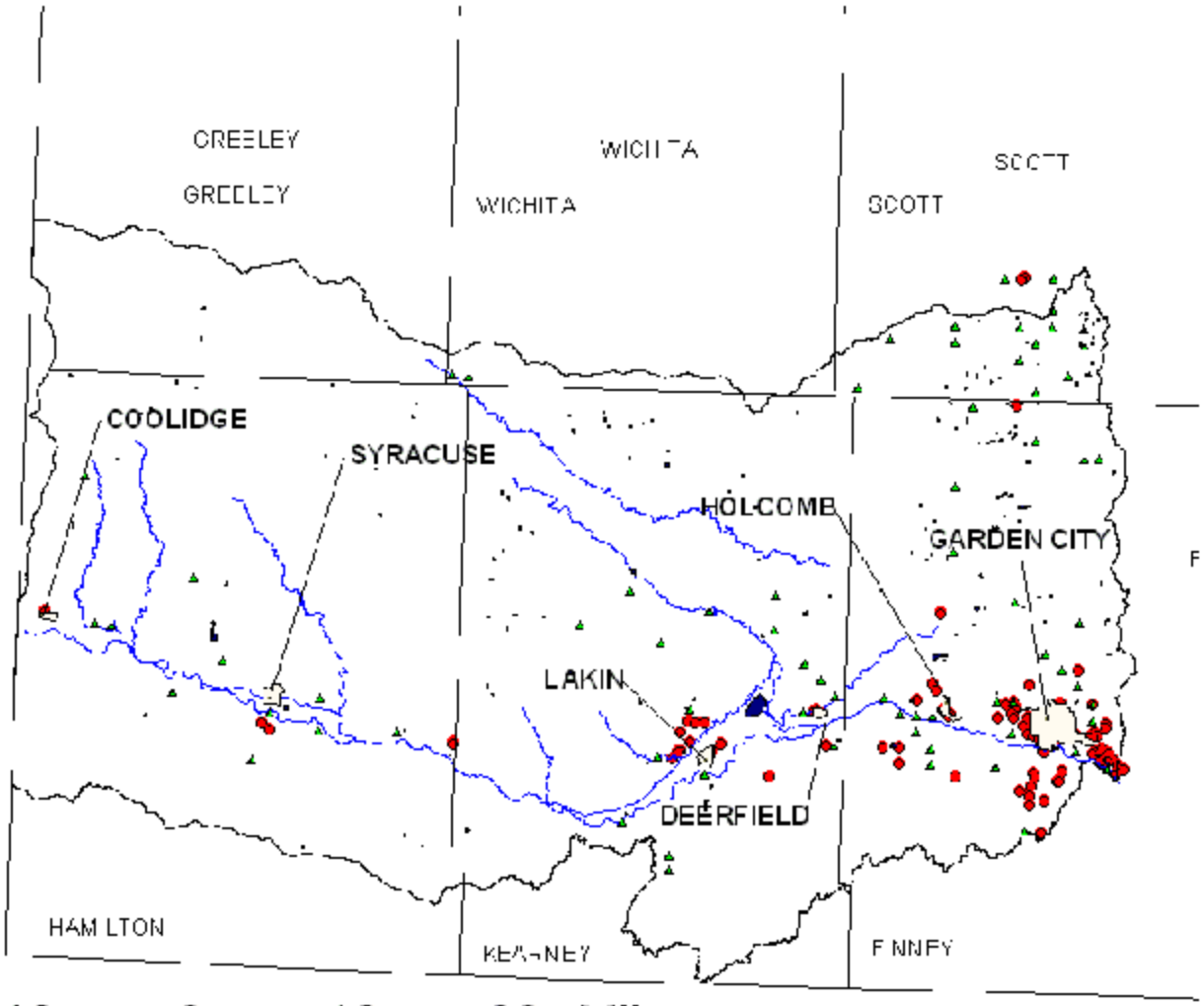
20 0 20 40 Miles

Streams & Rivers
Huc 11030001

Huc -11030001- Middle Arkansas- Lake McKinney
Lake Monitoring Sites



Huc -11030001- Middle Arkansas-Lake McKinney Watershed Boundary



Attachment 2

Site Data

KDHE Water Quality Monitoring Network
Surface Water Sampling Data
Arkansas River
1994 Through 1999

Site Name	HUC8	Sample Date	Ammonia	K (ND)	Atrazine	K (ND)	BOD	K (ND)	FCB	K (ND)	Nitrate	K (ND)	TSS	P	K (ND)
Water Quality Standard			pH*		3.00		None		00/2,000*		10.00		None*	None*	
SC223	11030001	26-Apr-94	0.06		0.30	K	2.20		300		1.08		152	0.33	
SC223	11030001	28-Jun-94	0.06				3.20		200		0.81		104	0.11	
SC223	11030001	23-Aug-94	0.14		0.30	K	2.70						34	0.07	
SC223	11030001	18-Oct-94	0.10				3.09						180	0.26	
SC223	11030001	24-Jan-95	0.05		0.30	K	1.80				2.73		33	0.07	
SC223	11030001	27-Mar-95	0.15				2.70				2.59		90	0.14	
SC223	11030001	23-May-95	0.10		0.30	K	2.90				1.22		412	0.36	
SC223	11030001	25-Jul-95	0.14		0.30	K	1.90		210		0.44		160	0.19	
SC223	11030001	26-Sep-95	0.17		0.30	K	1.00	K	300		1.61		114	0.17	
SC223	11030001	28-Nov-95	0.11				1.40		40		1.87		22	0.05	
SC223	11030001	27-Feb-96	0.01	K	0.30	K	1.90		20		2.00		53	0.09	
SC223	11030001	23-Apr-96	0.03				1.50		15		1.47		75	0.10	
SC223	11030001	25-Jun-96	0.53		0.38		7.70		3000		1.33		1590	0.93	
SC223	11030001	27-Aug-96	0.04				2.30		830		1.65		316	0.30	
SC223	11030001	22-Oct-96	0.17		0.30	K	3.10		200		2.14		118	0.12	
SC223	11030001	17-Dec-96	0.02	K			5.00		10		2.61		37	0.04	
SC223	11030001	29-Jan-97	0.02	K			1.89				2.57		27	0.05	
SC223	11030001	18-Mar-97	0.03		0.30	K	1.89		10	K	1.95		91	0.06	
SC223	11030001	20-May-97	0.02	K			2.16		230		1.06		126	0.10	
SC223	11030001	22-Jul-97	0.04		0.30	K	3.45		400		0.87		166	0.19	
SC223	11030001	16-Sep-97	0.02	K			3.57		800		2.10		96	0.12	
SC223	11030001	18-Nov-97	0.16		0.30	K	2.64		200		2.59		47	0.09	
SC223	11030001	17-Feb-98	0.02	K			3.99		10	K	1.75		27	0.04	
SC223	11030001	21-Apr-98	0.12		0.30	K	1.00	K	70		2.05		368	0.29	
SC223	11030001	16-Jun-98	0.02	K			1.00	K	190		1.10		82	0.14	
SC223	11030001	18-Aug-98	0.16		0.30	K	4.35		40		1.78		220	0.20	
SC223	11030001	20-Oct-98	0.02	K			1.00	K	270		1.61		76	0.08	
SC223	11030001	15-Dec-98	0.02	K	0.30	K	1.00	K	10		2.45		42	0.05	
SC223	11030001	08-Feb-99	0.04				4.32				2.06		19	0.04	
SC223	11030001	12-Apr-99	0.05				2.70				2.26		40	0.05	
SC223	11030001	07-Jun-99	0.02				2.94				0.51		296	0.22	
SC223	11030001	09-Aug-99	0.13				3.66				1.53		140	0.30	

SC223	11030001	11-Oct-99	0.07		0.30	K	5.82				1.71		132	0.19				
SC223	11030001	11-Oct-99	0.27		0.30	K	6.60				1.70		63	0.08				
SC223	11030001	13-Dec-99			0.30	K												
SC223	11030001	13-Dec-99			0.30	K												
SC598	11030001	26-Apr-94	0.05	K	0.30	K	1.60		300		1.23		74	0.06				
SC598	11030001	26-Jun-94	0.05	K			3.40		500		0.62		216	0.14				
SC598	11030001	23-Aug-94	0.07		0.30	K	3.30						135	0.13				
SC598	11030001	18-Oct-94	0.08				2.37						232	0.21				
SC598	11030001	24-Jan-95	0.21		0.30	K	2.60				3.65		90	0.28				
SC598	11030001	27-Mar-95	0.06				2.50				2.06		78	0.12				
SC598	11030001	23-May-95	0.10		0.30	K	3.40				1.16		156	0.31				
SC598	11030001	25-Jul-95	0.09		0.30	K	1.70		40		0.23		92	0.11				
SC598	11030001	26-Sep-95	0.20		0.30	K	1.40		100		1.37		168	0.16				
SC598	11030001	28-Nov-95	0.17				1.50		20		2.51		85	0.09				
SC598	11030001	27-Feb-96	0.01	K	0.30	K	1.90		1		1.99		268	0.23				
SC598	11030001	23-Apr-96	0.02				2.30		100		1.63		172	0.16				
SC598	11030001	25-Jun-96	0.31		0.33		3.10		780		1.02		490	0.37				
SC598	11030001	27-Aug-96	0.04				2.20		380		1.33		292	0.26				
SC598	11030001	22-Oct-96	0.12		0.30	K	3.60		600		1.92		160	0.15				
SC598	11030001	17-Dec-96	0.02	K			4.70		10	K	2.37		69	0.06				
SC598	11030001	29-Jan-97	0.02				1.74				2.36		105	0.09				
SC598	11030001	18-Mar-97	0.06		0.30	K	1.41		20		1.97		72	0.12				
SC598	11030001	20-May-97	0.04				1.89		150		1.09		39	0.10				
SC598	11030001	22-Jul-97	0.05		0.49		1.98		**2200**		1.21		416	0.25				
SC598	11030001	16-Sep-97	0.02	K			2.19		40		1.55		68	0.06				
SC598	11030001	18-Nov-97	0.04		0.30	K	2.43		50		2.40		108	0.13				
SC598	11030001	17-Feb-98	0.02	K			3.21		20		1.43		62	0.08				
SC598	11030001	21-Apr-98	0.09		0.30	K	1.00	K	60		1.79		300	0.27				
SC598	11030001	16-Jun-98	0.02	K			1.33		100		1.21		138	0.17				
SC598	11030001	18-Aug-98	0.02	K	0.30	K	1.71		20		0.91		150	0.13				
SC598	11030001	20-Oct-98	0.02	K			1.00	K	330		1.67		136	0.10				
SC598	11030001	15-Dec-98	0.02	K	0.30	K	1.00	K	20		2.32		71	0.06				
SC598	11030001	08-Feb-99	0.03				1.59				1.98		56	0.05				
SC598	11030001	12-Apr-99	0.03				2.88				1.92		110	0.09				
SC598	11030001	07-Jun-99	0.04		0.30	K	5.28				0.43		544	0.42				
SC598	11030001	09-Aug-99	0.12				2.13				1.09		284	0.31				
SC598	11030001	11-Oct-99	0.08		0.30	K	6.30				3.50		116	0.10				
SC598	11030001	13-Dec-99			0.30	K												
% Samples Exceeding Standard					2%				27%		0%							
Total Number of Samples			230		108		229		161		220		230	230				

Notes:

Results expressed in **"bold"** type exceed applicable water quality standards.

pH* = Water quality standard is pH dependent and varies between 0.254 and 3.480 mg/L for pH 9.0 through 6.5, respectively for chronic exp

* Water quality standards for these constituents are currently in narrative form with no quantitative standard for comparative use.

900/2,000* = No sample shall exceed 900 FCB organisms per 100 ml between April 1 and October 31. From November 1 through March 31 the relavant standard is 2,000 FCB organisms per 100 ml.

K= "K" denotes that sample was not detected above method detection limit value shown in the adjacent data cell.

FCB=Fecal Coliform Bacteria (Count Per 100 Milliliters)

BOD=Biological Oxygen Demand

TSS=Total Suspended Solids

P=Phosphorus

Atrazine concentration shown in micrograms per liter. All other data concentrations shown in milligrams per liter unless noted otherwise.